LECTURE 1: INTRODUCTION

- There's enough food to feed the global population: distribution + access issues
- Food production has increased faster than growth in population in recent history
- 1/9 (11%) of worlds pop. are chronically undernourished
    - Most in developing countries
- 34 countries face food shortages (27 in Africa)

South Sudan

- Famine declared Monday 20th February 2017
    - ½ countries pop won't have access to affordable food in July
    - Large scale migration to Uganda – seeking refuge
- Pop: 12 million, civil war since 2013, gained independence in 2011
- Rich in resources, esp oil
- Previous famine in 1998

UNDERNOURISHMENT

Insufficient calories and proteins to live a healthy life
A person who doesn't get enough food, or enough of the right kinds of food, to sustain good health + work

Extent:
- Worldwide: 795 million
- Developing: 780 million
- Developed: 15 million

- Prevalence in Africa, some of Asia + parts of the Middle East, Central + South America
- Significant improvement in past 20 years – motivation of Millennium Development Goals (MDG) using a 1992 baseline
- Every region has reduced % proportion of population undernourished: yet total number of undernourished increased due to population growth
    - Least progress in sub-Saharan Africa
- ***Undernourishment increases vulnerability to famine + reduces resistance to disease***

Types of Undernutrition
- Undernutrition: insufficient calories and/or protein
- Dietary deficiencies: lack of micronutrients
- Secondary Undernutrition: poor health impedes nutrient uptake + diarrhoea

FAMINE

An excess in mortality caused by starvation
An extreme scarcity of food
UN Definition (based on 3 conditions)

1. 20% of population must have fewer than 2,100 kilocalories of food available a day
2. 30% of children must be acutely malnourished
3. 2 deaths per day in every 10,000 people (or 4 per day in 10,000 children) – must be caused by lack of food

- Common features: exceptional event, increases in mortality, severe social disruption (institutional + demographic changes)

Consensus on definition of Famine
- Previously, debate on definition of famine + when to declare state of famine
- Important: to design solutions + prevent in the future, + have effective international response
- Sudan 1998: lack of agreement on definition caused delay in declaring famine = deaths

Operationalising Famine
- Triangulation of a range of indicators:
    - Anthropometric (age, sex, weight, height)
    - Mortality
    - Livelihood
- Thresholds
    - Crude mortality rates (2/10,000/day)
    - Acute undernutrition (>30% population)
    - Actual v minimum food consumption gap (>20%)

Explaining Famine

1. **Relative Abundance Argument** (Availability)
    a. Too many people, not enough food
        i. Agricultural production cant keep up with population growth in certain areas
        ii. Environmental degradation + environmental change undermine food production
2. **Distribution Argument** (Access)
    a. Issues: who produces food, what sort of food is produced + who gets the food
    b. Issues apply at global, regional, national + local scales
3. **Multicausal Argument**
    a. No single cause factor, result of short + long term factors + complex feedback effects
    b. Due to failure to respond + lack of accountability
4. **Place Matters**
    a. Geography of famines + food security – each famine is different due to *place*
    b. Solutions depend on theories + circumstances of each case

LECTURE 6: ENVIRONMENTAL DEGRADATION + TECHNOLOGICAL INNOVATION

Famine as a Process: Instead of just an event, and climate as part of this process

- Technological innovation: around 8,000 years ago (transition to agriculture): plough/hoe invented
    - Allowed for correct planting of seeds

Finland, 1969-1971

- Shows the impact of climate on famine
- Colder than normal period, during the *Little Ice Age (Maunder Minimum)*
- Resulted in 1/3 of the population dying in a 2-3 year period
- Finland: has a marginal climate for productivity
- Chain of events: series of crop failures due to crops, less crops, next year's cops eaten, less yield for next year, stock killed for food, less productivity – cumulative effect, amplified by actions
- *Climate only part of the problem
- *Government Response:* lack of assistance, didn't give loans as thought starving people would die + not re-pay loans
    - Gave grains at end of growing season – too little too late

SOILS

- Understanding soil processes allows us to locate productive areas + understand likely consequence of converting a certain area to cropland

Plants + Soils

- Strong relation between soil + food production
- Plants need: air, water, warmth, light + nutrient (all climate related, nutrients soil related as well)
    - Nutrients: potassium, nitrogen + phosphorous

Nature of Soil

- Consists of: matter in all states (liquids, solid + gases), organic + mineral matter and water + air
- Feedback effects lead to soil degradation – we must overcome these to maintain productivity
    - Famine risks where degradation is not kept in check

Controls on Soil

Control	Explanation
Relief/Slope	• Steep slope = thin soils, due to fast speed of substrate movement • Less steep slope, lowlands = thick soils, material in situ, better productivity **Cantena:** idea that different soils on varying slopes have varying depths due to slope variations of water, climate + vegetation • Further down slope = increased productivity
Organisms	• Plants: biological weathering, roots + gas exchange, infiltration + evapo-transpiration • Macro-organisms: bioturbation (move material around) – redistribute chemicals, water + gases • Micro-organisms: decomposition
Bacteria	• Nitrogen-fixing Bacteria: decompose dead organic material, leaving behind more soil nitrogen • Nitrifying Bacteria: change ammonia to nitrate, preferred form of nitrogen for some plants • Denitrifying Bacteria: take out productivity, anaerobic soils
Vegetation (Humus) *important for holding nutrients	• Dead plant matter adds organic material to soil • Humus, colloids + compost: terms for decayed plant or animal matter • Results in dynamic equilibrium of production (used in wet warm areas) + destruction (used in biological productivity) • Soil particles become negatively charged + attracted positively charged ions (Ca, Mg, K, Na)

Soil Forming Processes

- Enrichment: material added by aeolian (wind) or fluvial (water) deposition
- Removal: leaching, solution + relocation of minerals
- Translocation: *Eluviation* (downward) + *Illuviation* (upward) movement of fine material
- Transformation: decomposition of organics to humus

Rainfall + Soils

Infiltration Excess Overland Flow	Throughflow	Surface Energy
• Ground has ability to infiltrate water at surface, excess flowers over land • Controlled by permeability of soil • Infrequent: need high rates of rainfall to exceed infiltration rate of natural soils	• Water moves through the ground • Solute pathway: water has energy potential, will flow depending on depth of bedrock, permeability, macropores + surface vegetation • Flow through ground slower than overland flow	• Overland flow begins as sheet flow, becomes channelized, forms gullies then small river channels • More connected the flow, the greater its energy: faster velocity, lower influence of channel boundary friction + greater discharge

AGRICULTURAL TRANSFORMATIONS

Time

- Nomadic
- Sedentary Pastoralism (clearing, less diversity of plants + ploughing)
- 15th C: Translocation of Food (global movement of crops)
- Industrial Revolution (18th – 19th C) – mechanisation
- Green Revolution

RUSLE (Universal Soil Loss Equation)

- Created to represent the potential long term average annual soil loss based on a formula

US 1930's Dust Bowl

- Agricultural expansion on N. American plains
- Poor care for soil – led to massive degradation + erosion, which amplified the drought conditions
- Loss of productive topsoil = long-term effects for food security + economic development
- Famine? No, people could migrate

Pastoralism: Clearing the Ground

Effects/Impacts

- Immediate: remove interception of rain + evapotranspiration = increase of rain hitting the ground
- Long-Term: reduce humus input, reduce nutrient input, leach nutrients, reduce soil cohesion by removing roots

Morphological Effects

- Surface sealing = increased overland flow
- Rilling + gullying = increased energy available for erosion (concentrates flow)
- *Magnitude of these effects determined by:*
    - Precipitation
    - Infiltration capacity
    - Slope angle + slope length
    - Surface cover